

## Systematic Study on Anthozoa from the Korea Strait in Korea: Subclasses Zoantharia and Ceriantipatharia

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한국 남해산 산호충류의 계통분류학적 연구 — 말미잘아강 및 꽃말미잘 아강

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### 摘 要

한국산 산호충류의 계통분류학적 연구의 일환으로 1984년부터 1991년까지 남해 연안과 여러 도서지방(34개 지역)으로 부터 채집된 말미잘류 및 꽃말미잘류를 동정 분류하였다. 그 결과 2아강 3목 16속 21종이 밝혀졌으며 이 중 해변 말미잘 목에 속하는 *Flosmaris mutsuensis*, *Hormathia andersoni* 및 *Verrillactis paguri* 3종은 한국미기록종이었다.

Key words: systematics, Anthozoa, Zoantharia, Ceriantipatharia, Korea Strait.

## INTRODUCTION

This work is the continuation of the systematic study on the Korean Anthozoa, and the author intended to reconsider the classification and the geographical distribubution of Zoantharia and Ceriantipatharia from

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the Korea Strait by identifying the new specimens and considering the previous papers. The subclass Ceriantipatharia containing 2 orders are sometimes included in the subclass Zoantharia (= Hexacorallia) (Hyman, 1940; 内田, 1968). The zoantharian and ceriantipatharian fauna of the Korea Strait has been poorly known and 16 species have been recorded in three orders, Actiniaria (Song, 1984), Scleractinia (Song, 1982, 1991) and Antipatharia (Song, 1987).

## MATERIALS AND METHODS

For the faunal study of Zoantharia and Ceriantipatharia in Korea Strait, Both previous records from this area (Song, 1982; 1984; 1987; 1991) and new specimens collected from 1984 to 1991 were collectively examined. Specimens were obtained from the coasts during low tide and from sublittoral zone by skin and SCUBA diving and fishing nets. After relaxation with menthol, stony corals and antipatharians were preserved in 70-80% alcohol, and sea-anemones were fixed in 5% formalin.

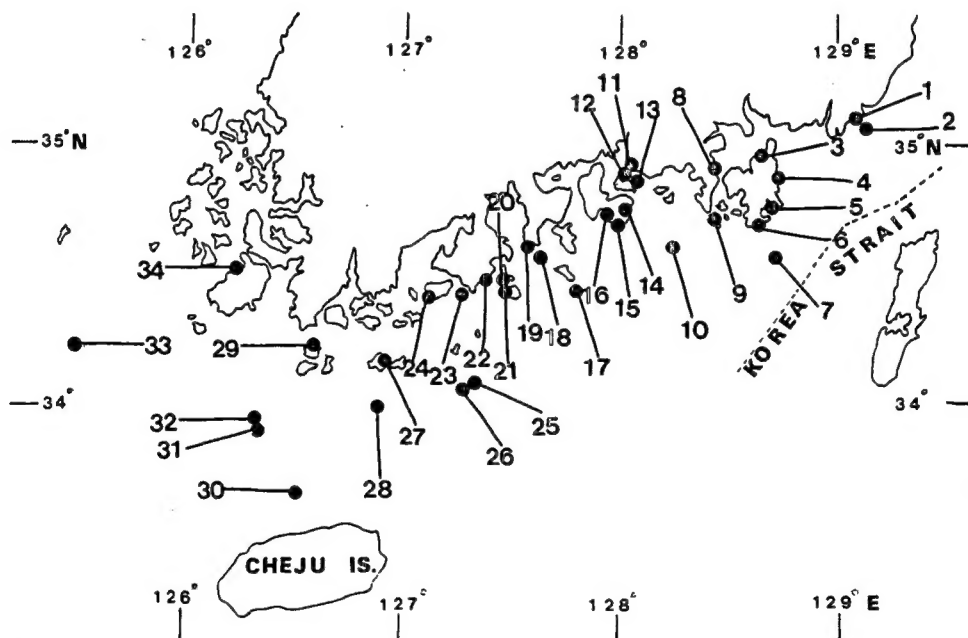


Fig 1. The sampling sites for the zoantharians and ceriantipatharians from 1984 to 1991.

1. Mip'o(미포); 2. Oryukto(오륙도); 3. Kōjedo(거제도); 4. Changsŭngp'o(장승포); 5. Yundoldo(율돌도); 6. Haegumkang(해금강); 7. Hongdo(홍도); 8. Ch'ungmu(충무); 9. Pijindo(비진도); 10. Yokchido(육지도); 11. Samch'ōnp'o(삼천포); 12. Nūkdo(늑도); 13. Shinsudo(신수도); 14. Namhaedo(남해도); 15. Yangp'ung(양풍); 16. Sangju(상주); 17. Sorido(소리도); 18. Wōnhak(원학); 19. Uhak(우학); 20. Pongnam(봉남); 21. Narodo(나로도); 22. Naebal(내발); 23. Chijuk(지죽); 24. Ongnyong(옥룡); 25. Daesambudo(대삼부도); 26. Kōmundo(거문도); 27. Ch'ōngsando(청산도); 28. Yōsōdo(여서도); 29. Nowhado(노화도); 30. Kwantaldo(관탈도); 31. Sasudo(사수도); 32. Ch'ujado(추자도); 33. Chindo(진도); 34. Manjaedo(만재도).

The cnidae was examined and measured with an ocular micrometer at x1000 magnification of a light microscope by squashing bits of tissue on a drop of phenol-glycerine solution. Anatomical studies were conducted by means of dissection and by making serial sections. The sclero-septa and sclerenchyme were observed under the stereomicroscope after polyps were resolved in clorax.

The zoantharians and cerantipatharians examined in the present study turned out to be 21 species, 16 genera, 10 families in three orders at 34 sites (Fig.1), of which six species (five species of sea-anemones and one species of antipatharians) are newly recorded from the Korea Strait, and moreover contain three unrecorded species from Korea. The 21 species from the Korea Strait are listed in this paper and three unrecorded species are described in detail with illustrations. The classification system is based upon Wells and Hill (1956) and Dunn (1982). The specimens are deposited in the Department of Biology, Ewha Womans University.

## SYSTEMATIC ACCOUNTS

Phylum Cnidaria Hatschek, 1888    자포동물 문  
 Class Anthozoa Ehrenberg, 1834    산호충 강  
 Subclass Zoantharia de Blainville, 1830    말미잘 아강  
 Order Actiniaria R. Hertwig, 1882    해변말미잘 목  
 Suborder Nynantheae Carlgren, 1899    니난트 아목  
 Tribe Thenaria Carlgren, 1899    족반 족  
 Subtribe Endomyaria Stephenson, 1921    내근 아족  
 Family Actiniidae (Gosse, 1858)    해변말미잘 과  
 Genus *Actinia* Browne, 1756    해변말미잘 속

### 1. *Actinia equina* Linné, 1767    해변말미잘

Previous records in Korea Strait: Mip'o (Song, 1984).

Material examined: Hongdo, May 31, 1987, 4 inds. (J. G. Gae)

Distribution: Korea (Korea Strait, Cheju Is., Sea of Japan), Japan, Atlantic, the Mediterranean, Black Sea.

Genus *Anthopleura* Duchassaing and Michelotti, 1860    꽃해변말미잘 속

### 2. *Anthopleura japonica* Verrill, 1899    갈색꽃해변말미잘

Material examined: Kōmundo, May 27, 1987, 6 inds. (J. G. Gae); Pijindo, May 31, 1987, 5 inds. (J. G. Gae); Manjaedo, Aug. 23, 1988, 7 inds. (J. G. Gae); Sorido, Aug. 31, 1988, 3 inds. (J. G. Gae); Changsŭngp'o, Jul. 19, 1989, many inds. (J. I. Song); Yundoldo, Jul 19, 1989, many inds. (J. I. Song); Haegŭmkang, Jul. 20, 1989, many inds. (J. I. Song); Ongnyong, Jun. 30, 1991, many inds. (J. I. Song); Naebal, Jun. 30, 1991, many inds. (J. I. Song); Chijuk, Jul. 2, 1991, many inds. (J. I. Song), intertidal zone.

Distribution: Korea (Yellow Sea, Korea Strait, Sea of Japan), Japan (Honshu, Kyushu).

### 3. *Anthopleura kurogané* Uchida and Muramatsu, 1958    검정꽃해변말미잘

Previous records in Korea Strait: Sanju, Pogildo, Wando, Ch'ŏngsando, Narodo, Pijindo, Samch'ŏnp'o,

Shinsudo, Nukdo (Song, 1984).

**Material examined:** Samch'ŏnp'o, Dec. 26, 1986, many inds. (J. I. Song); Ch'ujado, May 23, 1987, 3 inds. (J. G. Gae); Ch'ujado, May 25, 1987, 1 ind. (J. G. Gae); Kōmundo, May 27, 1987, 13 inds. (J. G. Gae); Yokchido, Sep. 1, 1988, 3 inds. (J. G. Gae); Sanju, Apr. 26, 1990, 7 inds. (J. I. Song); Yangp'ung, Apr. 27, 1990, many inds. (J. I. Song); Naebal, Jun. 30, 1991, many inds. (J. I. Song); Pongnam, Jul 1, 1991, many inds. (J. I. Song); Chijuk, Jul. 2, 1991, many inds. (J. I. Song), intertidal zone.

**Distribution:** Korea (Yellow Sea, Korea Strait, Cheju Is., Sea of Japan); Japan (Hokkaido, Northern parts of Honshu), Atlantic, Pacific coasts of North America, Behring Sea.

#### 4. *Anthopleura midori* Uchida and Muramatsu, 1958 풀색꽃해변말미잘

Previous records in Korea Strait: Yunwhado, Ch'ongsando (Song, 1984).

**Materials examined:** Samch'ŏnp'o, Dec. 26, 1986, many inds. (J. I. Song); Changsunp'o, Jul. 19, 1989, many inds. (J. I. Song); Haegŭmkang, Jul 20, 1989, many inds. (J. I. Song); Yangp'ung, Apr. 27, 1990, many inds. (J. I. Song); Naebal, Jun. 30, 1991, many inds. (J. I. Song); Chijuk, Jul 2, 1991, many inds. (J. I. Song), intertidal zone.

**Distribution:** Korea (Yellow Sea, Korea Strait, Cheju Is., Sea of Japan), Japan (Hokkaido - Kyushu), Atlantic, Pacific coasts of America, Northern Europe.

#### 5. *Anthopleura pacifica* Uchida, 1938 태평양꽃해변말미잘

**Material examined:** Yundoldo, Jul 19, 1989, many inds. (J. I. Song); Yangp'ung, Apr. 27, 1990, 7 inds. (J. I. Song), intertidal zone.

**Distribution:** Korea (Korea Strait, Sea of Japan), Japan (Southern parts of Hokkaido, Mutsu Bay, Sagami Bay).

Genus *Epiactis* Verrill, 1869 방사해변말미잘 속

#### 6. *Epiactis japonica* (Verrill, 1869) 방사해변말미잘

**Material examined:** Mip'o, Oct. 10, 1987, 1 ind. (J. I. Song).

**Distribution:** Korea (Korea Strait, Sea of Japan), Japan (Kurile Is., Hokkaido - middle parts of Honshu).

Subtribe Acontiarina Carlgren in Stephenson, 1935 창사 아족

Family Isophelliidae Stephenson, 1935 유사돌말미잘 과 (신칭)

Thenaria (Acontiarina). Sphincter mesogloal. Mesenteries divisible into macro- and microcnemes, the older microcnemes may be provided with filaments and acontia. Acontia with 2 categories of nematocysts, basitrichs and microbasic amastigophores.

Genus *Flosmaris* Stephenson, 1920 꽃골풀말미잘 속 (신칭)

Isophelliidae with the elongate column divisible into scapus and scapulus, the former with tenaculi. Cinclides probably absent. Margin tentaculate. Tentacles simple, their longitudinal muscles ectodermal as are the radial muscles of oral disc. Sphincter mesogloal situated in the upper part of scapulus. 12 pairs of macrocnemes bearing gonads, filaments and strongly restricted (circumscribed?) retractors, all perfect. Microcnemes weak, consisting chiefly of a parietal muscle. Acontia present on the macrocnemes and on

some microcnemes.

**7. *Flosmaris mutsuensis* (Uchida, 1938) 꽃골풀말미잘 (신칭)**

(Pl. 1, Figs. 1-2,

Pl. 2, Figs. 1-5, Pl. 4, Figs. 1-2)

*Neophellia mutsuensis* Uchida, 1938 (pp. 311-313, text-figs. 25-28); Carlgren, 1949 (p. 76).

**Material examined:** Mip'o, Dec. 27, 1986. 2 inds. (J. I. Song), by fishig nets collecting shrimps.

**Description:** Body with a distinct pedal disc, divided into scapus and scapulus. Main part of scapus with tenaculi firmly attaches sand grains. Scapulus and basal part of column smooth, devoid of sand grains. Mesenterial insertions show through thin wall of pedal disc. In expanded specimen, column 33 mm long and 15 mm wide, of which scapulus 9 mm long and 7 mm wide, oral disc  $22 \times 20$  mm wide, and pedal disc 18 mm wide. In contracted specimen, column 20 mm long, 15 mm wide, of which scapulus infolded into mouth, and pedal disc 10 mm wide.

Margin tentaculate, regularly hexamerous. Tentacles arranged in 5 to 6 cycles, bluntly tapering towards tips. Outer tentacles (3 - 4 mm long) smaller than inner ones (4 - 5 mm long). Siphonoglyphs two, oral lobes 12 in number at both sides in  $4 \times 6$  mm diameter.

Mesogloel sphincter well-developed, with many muscles bundle distributed in several rows. Mesenteries arranged regularly hexamerous (in pairs,  $6 + 6 + 12 + 24$ ), divided into macrocnemes and microcnemes. First two cycles ( $6p + 6p$ ) macrocnemes including two pairs of directives all perfect, possesses circumscribed retrac-tor with well-developed parietobasilar muscles, a large gonad, and a filament. Second cycles of macrocnemes shorter than first cycles in coelenteron. Microcnemes ( $12p + 12p$ ) imperfect, weak, consisting chiefly of a parietobasilar muscle, mostly lack a mesenterial filament, and form narrow streaks on the body-wall. Acon-tia present on the macrocnemes and on at least some microcnemes. Cinclids probably absent.

In color, oral disc and tentacles pale brown, have brown transversal bands along radii. Oral lobes greyish brown, both siphonoglyphs white, and basal parts of 1st primary 6 tentacles have white spots. Scapulus orange, scapus and pedal disc pale yellow. Mesenterial insertions white, remaining parts semi-opaque. Acontia white.

**Table 1.** Comparison of size (mm) in relation to state of specimens.

state	Expanded		Contracted	
	length	width	length	width
parts				
Column	25-33	9-11	7-25	7-15
Scapulus	6-9	6-7	3-5	
Oral disc		$11 \times 10-22 \times 20$		
Pedal disc		15-18		10-11

Cnidom: Basitrichs. Microbasic p-mastigophores. Spirocysts.

Distribution and size ( $\mu$ ) of nematocysts are as follow:

Tentacles	Basitrichs	21.5-28.6 $\times$ 2.8-4.0
	Spirocysts	15.7-27.2 $\times$ 3.0-4.3

Actinopharynx	Basitrichs	12.9-2.9, 24.3-32.9 × 3.5-4.0
	Microbasic p-mastigophores	17.2-30.0 × 5.5-5.8
	Spirocysts (rare)	21.5-27.2 × 4.0-4.3
Oral lobe	Basitrichs	24.3-27.2 × 3.5-4.0
	Spirocysts	21.5-25.8 × 3.0-4.3
Scapulus	Basitrichs (rare)	10.0-15.8 × 2.5-3.0
	Microbasic p-mastigophores (very rare)	16.0-17.2 × 4.5-5.0
Scapus	Basitrichs	10.0-15.8 × 2.8-3.0, 20.0-27.2 × 3.0-3.2
	Microbasic p-mastigophores	10.0-12.9 × 3.5-4.0, 18.6-22.9 × 4.3-5.0 (rare)
	Spirocysts	18.6-25.8 × 3.5-4.3
Acontia	Basitrichs	22.9-32.9 × 4.0-5.0
	Microbasic p-mastigophores	32.9-42.9 × 5.0-5.8
	Spirocysts (rare)	21.5-35.8 × 3.5-4.3
Pedal disc	Basitrichs	11.4-18.6 × 2.8-3.0, 25.7-31.5 × 3.0-3.5
	Spirocysts (rare)	27.2-35.8 × 4.3-4.5

**Habitat:** This species bury themselves into sandy mud of intertidal zone, opening only their oral parts above muddy plate. Animals cylindrical at the expanded state, but cone-shaped at the disturbed state.

**Remarks:** Uchida (1938) established new genus *Neophellia* as belonging to family Paractiidae in subtribe Inermia, because the species differed from *Pheilia*, *Paraphellia* in having 12 perfect mesenteries and lacking acontia. Furthermore, it was distinguished from genus *Flosmaris* in the possession of acontia and mesenteries. Carlgren (1949) suggested that systematic position of this genus *Neophellia* was somewhat doubtful, and Uchida's diagnosis of the genus disagreed in some ways with his description of the species.

Our specimens are generally similar to Uchida's specimen in external features, but differ from it in having acontia and the equal secondary cycle of macrocnemes. As Uchida's specimen had 24 pairs ( $6+6+12=24$ ) of mesenteries and nearly 100 tentacles, It is clear that these might have been a fourth cycle of mesenteries in the distal part of the body. Therefore the genus *Neophellia* has to disappear and to be synonymous with the genus *Flosmaris* (Stephenson, 1920, 1935) because of possession of acontia and mesenteries (12 pairs of macrocnemes).

**Distribution:** Korea (Korea Strait), Japan (Mutsu Bay off Urata between Futago and Oshima).

#### Family Hormathiidae Carlgren, 1925 끈말미잘 과 (신칭)

Thenaria (Acontaria) with strong mesogloel sphincter. Mesenteries not divisible into macro- and microcnemes. Usually 6 pairs of perfect mesenteries, sometimes more. Perfect mesenteries usually sterile, rarely fertile. Nematocysts of acontia basitrichs only. Cnidom: spirocysts, basitrichs, microbasic p-mastigophores. Usually spirocysts large and broad.

#### Genus *Hormathia* Gosse, 1859 끈말미잘 속 (신칭)

Hormathiidae with developed base which is often attached to shells. Column divisible into scape and scapulus, the former provided with tubercles sometimes showing a tendency to be arranged in rows, more rarely most of the tubercles are reduced so that only a ring of tubercles, coronal tubercles, remain in the uppermost part of scapus. In young specimens the tubercles are often small or absent. Scapus usually with

more or less strong cuticle. Sphincter mesogloal, strong. Tentacles without mesogloal swelling on their outer sides, not more than 96 (or exceptionally a few more). Same number of mesenteries proximally as distally. Longitudinal muscles of tentacles and radial muscles of oral disc ectodermal, the latter sometimes meso-ectodermal. Two well developed siphonoglyphs, 6 pairs of perfect and sterile mesenteries, retractors diffuse. Cnidoms: spirosysts, basitrichs, microbasic p-mastigophores.

**8. *Hormathia andersoni* Haddon, 1888** 고동끈말미잘 (신칭)

(Pl. 1, Figs. 5-8,

Pl. 2, Figs. 6-9, Pl. 4, Fig. 3)

*Hormathia andersoni* Haddon, 1888 (p. 251); Carlgren, 1949 (p. 93).

*Hormathianthus tuberculatus* Carlgren, 1943 (pp. 33-35, pl. 2, figs. 3-6).

**Material examined:** Mip'o, May 23, 1982, 23 inds. (J. I. Song); Uhak, Aug. 5, 1983, 18 inds. (J. I. Song); Uhak, Aug. 6, 1983, 5 inds. (J. I. Song); Mip'o, Nov. 26, 1983, 41 inds. (J. I. Song); Mip'o, Nov. 27, 1983, 8 inds. (J. I. Song); Mip'o, Jan. 12, 1984, 18 inds. (H. S. Han); Samch'ŏnpo, Jul. 22, 1984, 1 ind. (B. J. Rho and C. J. Shim); Mip'o, Dec. 27, 1986, 61 inds. (J. I. Song); Sangju, Apr. 26, 1990, 2 inds. (B. J. Rho and J. W. Lee), attached to shells of gastropods and bivalves collected by fishing nets of shrimps.

**Description:** Column divided into scapus and scapulus. Cincilides absent. Scapus usually with small or distinct tubercles, and usually a greater development of cuticle. Scapulus with 12 longitudinal ridges to make a ring of tubercles, dark in color, which alternate with 12 pale patches.

Tentacles up to 96 in number, in 5 cycles (6 + 6 + 12 + 24 + 48). Same number of mesenteries proximally as distally. Longitudinal muscles of tentacles and radial muscles of oral disc ectodermal.

Mesogloel sphincter well-developed, with many muscles bundle distributed in several rows. Two siphonoglyphs well-developed. Mesenteries arranged regularly hexamerous (in pairs, 6 + 6 + 12 + 24) in a symmetrical form. First cycle, 6p including two pairs of directives perfect, sterile, and possesses diffuse retractor with well-developed parietobasilar muscles. Second and third cycles of mesenteries possesses also diffuse retractor with well-developed parietobasilar muscles, a large gonad, and a filament. 4th cycle weak, consisting chiefly of a parietobasilar muscle, mostly lack a mesenterial filament. Acontia present.

In color, column variable, mostly yellowish white to reddish brown with transversal brownish dotted lines. Pedal disc and limbus yellowish white, show transparency mesenteries through thin wall. Scapulus pale with 12 longitudinal brown ridges. Tentacle yellowish white with a brown spot at basal part of each tentacle. Oral lobe dark reddish brown.

**Table 2.** Comparison of size(mm) in relation to state of specimens.

state	Expanded		Contracted	
	length	width	length	width
parts				
Column	10-30	8-16	10-25	
Scapulus	4	8-20	0	
Scapus	15	8-27	10-25	10-22
Oral disc		11-21	1-4	
Pedal disc		14-40	10-46	

Cnidom: Spirocysts, Basitrichs, Microbasic p-mastigophores.

Distribution and size ( $\mu$ ) of nematocysts are as follow:

Tentacles	Basitrichs	18.6-27.0 $\times$ 2.9-4.3
	Spirocysts	15.8-34.3 $\times$ 2.9-4.3
Oral disc	Basitrichs	21.5-28.6 $\times$ 2.9-4.3
	Microbasic p-mastigophores (rare)	17.0-21.5 $\times$ 4.0-4.3
	Spirocysts	21.5-34.3 $\times$ 4.0-5.8
Actinopharynx	Basitrichs	27.2-31.5 $\times$ 4.0-4.3
	Microbasic p-mastigophores	18.6-22.9 $\times$ 4.3-4.6
Siphonoglyph	Basitrichs	22.9-28.6 $\times$ 3.0-3.5
	Microbasic p-mastigophores	20.0-21.5 $\times$ 4.0-4.3
	Spirocysts	17.2-32.9 $\times$ 3.5-5.8
Column	Basitrichs (rare)	14.3-17.2 $\times$ 3.0-3.5, 27.2-31.5 $\times$ 4.0-4.3
Pedal disc	Basitrichs	15.8-20.0 $\times$ 3.5-4.3, 28.6-30.0 $\times$ 4.0-4.3
Acontia	Basitrichs	24.3-32.9 $\times$ 3.5-4.3

**Habitat:** This species attached to many kinds of molluscan shells (*Penctin* sp, *Acila mirabilis*, *Japeuthria ferrea*, *Japenthria cingulata*, and others).

**Remarks:** This species is more likely to be confused with *Hormathia coronata* in terms of differences of detail for which on pale scapulus it has 12 dark markings, but shape and color of tubercles are different (Stephenson, 1935; Carlgren, 1949; Manuel, 1988). The pattern on the arrangement of tentacles and mesenteries closely resemble that of *H. coronata*. Although these specimens are mostly coincided with the original description of *Hormathianthus tuberculatus* (Carlgren, 1943) except for the number of tentacles, Carlgren (1949) suggested also that *Hormathianthus tuberculatus* and *Hormathia andersoni* are possibly the same species.

**Distribution:** Korea (Korea Strait), Viet Nam (Bay of Nhatrang), Cambodia (Ream), Poulo Condore.

Family Sagartiidae (Gosse, 1858) 사가트말미잘 과 (신칭)

Thenaria (Acontaria) with mesogloal sphincter. Mesenteries not differentiated into macro- and microcnemes. Acontia with microbasic amastigophores and basitrichs.

Genus *Verrillactis* 손말미잘 속 (신칭)

Sagartiidae with well-developed base. Column smooth, not divisible into regions, provided with cindlides and with modified adhesive verrucae (suckers) capable of attaching foreign bodies. Sphincter mesogloal, stronger or weaker. Tentacles in several cycles, never long. Longitudinal muscles of tentacles and radial muscles of oral disc ectodermal. Two siphonoglyphs and two pairs of directives. 12 pairs of mesenteries perfect and sterile. Mesenteries more numerous at margin than at limbus. Retractors of mesenteries diffuse or somewhat restricted, never circumscribed. Gonads present from the mesenteries of first cycle onwards. Sometimes asexual reproduction. Acontia well developed. Cnidom: spirocysts, basitrichs, microbasic p-mastigophores, microbasic amastigophores.

9. *Verrillactis paguri* (Verrill, 1869) 집게손말미잘 (신칭)

(Pl. 1, Figs. 3-4.

Pl. 3, Figs. 1-6, Pl. 4, Fig. 4)



*Sagartia paguri* Verrill, 1869 (p. 57); 難波, 1923 (pp. 464-465).

?*Adamsia* (*Sagartia*) *paguri*: Carlgren, 1949 (p. 98).

*Verrillactis paguri*: Uchida, 1981 (p. 67, p. 322).

**Material examined:** Uhak, Aug. 6, 1983, 28 inds. (J. I. Song); Mip'o, Nov. 27, 1983, 9 inds. (J. I. Song); Kōjedo, Jul 19, 1989, many inds. (J. I. Song, H. S. Hann and S. J. Yoon); Sangju, Apr. 26, 1990, 7 inds. (B. J. Rho and J. W. Lee), intertidal zone - 40 m deep (by fishing nets).

**Description:** Sagartiidae with well-developed pedal disc. Column low, smooth, transparency with tenaculi situated on slight elevations. Ectoderm of column very thin without cuticle, thick mesodermal evagination. Uppermost part of column forms fine ridges in contraction. Fosse deep.

Tentacles arranged hexamerous in 5 cycles (6 + 6 + 12 + 24 + 48), never long. Longitudinal muscles of tentacles ectodermal.

Mesogloal sphincter very weak. Two siphonoglyphs and two pairs of directives. Mesenteries arranged hexamerous, more numerous at uppermost part than at base. First cycle, 12 pairs including two pairs of directives perfect, fertile, and provided with filaments and acontia. Second and third cycles sterile, sometimes possesses a filament and acontia. Retractor diffuse, with very weak parietobasilar muscles.

In color, whole animals uniformly pale. Sometimes column translucent orange or flesh color, tentacles flesh color with a black spot at their base.

**Table 3.** Comparison of size(mm) in relation to state of specimens.

state	Expanded		Contracted	
	length	width	length	width
parts				
Column	2.9	7.9	2.6	
Oral disc		9.10		
Pedal disc		12.24	3.10	

Cnidom: Basitrichs, Microbasic p-mastigophores, Microbasic amastigophores, Spirocysts.

Distribution and size ( $\mu$ ) of nematocysts are as follow:

Tentacles	Basitrichs	17.2-18.6 × 3.0-4.4, 25.7-27.2 × 4.0-4.3
	Microbasic amastigophores	25.7-30.0 × 5.7-6.0
	Spirocysts	20.0-30.0 × 2.8-5.0
Oral parts	Basitrichs (rare)	20.0-27.2 × 3.5-4.3
	Microbasic p-mastigophores	12.9-14.3 × 4.3-4.8
	Spirocysts	24.3-28.6 × 5.0-5.7
Actinopharynx	Basitrichs	18.6-21.5 × 3.5-4.3
	Microbasic amastigophores	22.9-28.6 × 4.0-4.3
	Spirocysts	31.5-41.5 × 5.7-6.4
Column	Basitrichs (very rare)	18.6-21.5 × 3.5-4.3
	Microbasic p-mastigophores (rare)	12.9 × 4.0
Acontia	Basitrichs	10.0-17.2 × 4.0-4.3
	Microbasic amastigophores	14.3-17.2 × 4.0-4.3
		32.9-35.8 × 5.0-5.7

**Habitat:** This species attached both on left cheliped and on shell housing of hermit crabs, *Diogenes edwardsii* (De Hann, 1949). Molluscan shells are various, *Naptunea arthritica*, *Japenthria ferrea*, *Rapana venosa*, *Rapana thomasi*, *Fusinus perplexus*, *Neverita (Glossaulax) didyma*, *Sydaphera spengleriana*, and others.

**Distribution:** Korea (Korea Strait), Japan (Sagami Bay, southern part of Yamagata-ken), China Sea, Wakanoura Kii.

Family Haliplanellidae Hand, 1955      줄말미잘 과

Genus *Haliplanella* Hand, 1955      줄말미잘 속

#### 10. *Haliplanella lucia* (Verrill, 1898)      담황줄말미잘

Previous records in Korea Strait: Narodo, Sorido, Shinsudo, Nukdo, Hongdo (Song, 1984).

**Material examined:** Samch'ŏnpo, Nov. 1984, 4 inds. (Y. W. Kim), Changsŭngp'o, Jul. 19, 1989, many inds. (J. I. Song); Yundoldo, Jul. 19, 1989, many inds. (J. I. Song); Haegŭmkang, Jul. 20, 1989, many inds. (J. I. Song); Yangp'ung, Apr. 27, 1990, many inds. (J. I. Song); Ongnyong, Jun. 30, 1991, many inds. (J. I. Song); Naebal, Jun. 30, 1991, many inds. (J. I. Song); Pongnam, Jul. 1, 1991, many inds. (J. I. Song), intertidal zone.

**Distribution:** Korea (Yellow Sea, Korea Strait, Cheju Is., Sea of Japan), Cosmopolitan.

Order Scleractinia Bourne, 1900      돌산호 목

Suborder Faviina Vaughan and Wells, 1943      벌집돌산호 아목

Superfamily Faviace Gregory, 1900      벌집돌산호 상과

Family Rhizangiidae d'Orbigny, 1851      근생돌산호 과

(= Astrangiidae Verrill, 1869)

Genus *Culicia* Dana, 1848      흑돌산호 속

#### 11. *Culicia japonica* Yabe and Eguchi, 1936      흑돌산호

Previous records in Korea Strait: Ch'ungmu, Daesambudo (Song, 1991).

**Distribution:** Korea (Korea Strait, Cheju Is.), Japan (Sagami Bay).

Genus *Oulangia* M. Edw. and H., 1848      진돌산호 속

#### 12. *Oulangia stokesiana miltoni* Yabe and Eguchi, 1932      밀튼진돌산호

Previous records in Korea Strait: Wŏnhak, Uhak, Mip'o (Song, 1991).

**Distribution:** Korea (Yellow Sea, Korea Strait), Japan.

Suborder Caryophylliina Vaughan and Wells, 1943      정향돌산호 아목

Superfamily Caryophylliidae Gray, 1847      정향돌산호 상과

Family Caryophylliidae Gray, 1847      정향돌산호 과

Genus *Caryophyllia* Lamarck, 1801      정향돌산호 속

#### 13. *Caryophyllia japonica* Marenzeller, 1888      정향돌산호

Previous records in Korea Strait: Mip'o (Song, 1982, 1991).

Distribution: Korea (Korea Strait, Sea of Japan), Japan, Philippines, Banda Sea, Indian Ocean (Andamans, Laccadive Is., Seychelles, Providence, Saya de Malha).

Genus *Cyathoceras* Moseley, 1881    킵돌산호 속

**14. *Cyathoceras niinoi*** Yabe and Eguchi, 1942    니노킵돌산호

Previous records in Korea Strait: Mip'o (Song, 1982, 1991).

Distribution: Korea (Korea Strait), Japan (Hase-maru).

Genus *Heterocyathus* M. Edw. and H., 1848    이형킵돌산호 속

**15. *Heterocyathus aequicostatus*** M. Edw. and H., 1848    이형킵돌산호

Previous records in Korea Strait: Mip'o, Kōjedo, Uhak (Song, 1982, 1991).

Distribution: Korea (Yellow Sea, Korea Strait), Japan, China Sea, Taiwan, Philippines, Indonesia, Ceylon, Persian Gulf, South Africa.

**16. *Heterocyathus japonicus*** (Verrill, 1866)    일본이형킵돌산호

Previous records in Korea Strait: Mip'o, Oryukto, Uhak (Song, 1982, 1991).

Distribution: Korea (Korea Strait, Sea of Japan), Japan, Taiwan, Java.

Superfamily Flabellidae Bourne, 1905    부채돌산호 상과

Family Flabellidae Bourne, 1905    부채돌산호 과

Genus *Flabellum* Lesson, 1831    부채돌산호 속

**17. *Flabellum transversale*** Moseley, 1881    횡주름부채돌산호

Previous records in Korea Strait: Mip'o, Oryukto, Ch'ujado (Song, 1982, 1991).

Distribution: Korea (Korea Strait), Japan, Philippines, Australia, New Zealand.

Suborder Dendrophyllina Vaughan and Wells, 1943    나무돌산호 아목

Family Dendrophylliidae Gray, 1847    나무돌산호 과

Genus *Dendrophyllia* de Blainville, 1830    나무돌산호 속

**18. *Dendrophyllia cribrosa*** M. Edw. and H., 1860    유착나무돌산호

Previous records in Korea Strait: Chindo, Sanju, Nowhodo, Namhaedo, Uhak (Song, 1982, 1991).

Distribution: Korea (Korea Strait, Sea of Japan), Japan (Southern coast).

Genus *Rhizopsammia* Verrill, 1869    뿌리돌산호 속

**19. *Rhizopsammia minuta mutsuensis*** Yabe and Eguchi, 1932    무쓰뿌리돌산호

Previous records in Korea Strait: Mip'o (Song, 1991).

Material examined: Yangp'ung, Apr. 27, 1990, many inds. (J. I. Song), intertidal zone.

Distribution: Korea (Yellow Sea, Korea Strait, Sea of Japan), Japan.

Subclass Ceriantipatharia van Beneden, 1898      꽃말미잘 아강

(=Hexacorallia Gotte, 1902)

Order Antipatharia M. Edw. and Haime, 1857      각산호 목

Family Antipathidae Verrill, 1865      해송 과

Subfamily Antipathinae Brook, 1889      해송 아과

Section Ramosae Brook, 1889      가지해송 절

Genus *Antipathes* Pallas, 1766      해송 속

**20. *Antipathes japonica* Brook, 1889      해송**

Material examined: Yōsōdo, Aug. 26, 1988, 1 ind. (J. G. Gae).

Distribution: Korea (Korea Strait, Cheju Is.), Japan (Sagami Bay, Enoshima), Formosa.

**21. *Antipathes lata* Silberfeld, 1909      긴가지해송**

Previous records in Korea Strait: Hongdo, Sasudo (Song, 1987).

Material examined: Daesambudo, May 28, 1987, 2 inds. (J. G. Gae); Manjaedo, Aug. 23, 1988, 1 ind. (J. G. Gae); Yōsōdo, Aug. 26, 1988, 1 ind. (J. G. Gae).

Distribution: Korea (Korea Strait, Cheju Is.), Japan (Misaki).

**Table. 4.** Number of zoantharian and ceriantipatharian species from Korea Strait.

Subclasses	Orders	Families	Genera	No. of species
Zoantharia	Actiniaria	Actiniidae	<i>Actinia</i>	1
			<i>Anthopleura</i>	4
			<i>Epiactis</i>	1
		Isophelliidae	<i>Flosmaris</i>	1
		Hormathiidae	<i>Hormathia</i>	1
		Sagartiidae	<i>Verrillactis</i>	1
		Haliplanellidae	<i>Haliplanella</i>	1
	Scleractinia	Rhizangiidae	<i>Culicia</i>	1
			<i>Oulangia</i>	1
			<i>Caryophyllia</i>	1
		Caryophylliidae	<i>Cyathoceras</i>	1
			<i>Heterocyathus</i>	2
			<i>Flabellum</i>	1
		Dendrophylliidae	<i>Dendrophyllia</i>	1
			<i>Rhizopsammia</i>	1
Ceriantipatharia	Antipatharia	Antipathidae	<i>Antipathes</i>	2
2 subclasses	3 orders	10 families	16 genera	21 spp.

## DISCUSSION

The zoantharians and the ceriantipatharians known from Korea Strait up to the present are 21 species, 16 genera, 10 families, 3 orders in 2 subclasses as shown in table 4. Of which six species, *Anthopleura japonica*, *A. pacifica*, *Flosmaris mutsuensis*, *Hormathia andersoni*, *Verrillactis paguri* and *Antipathes japonica* are new to Korea Strait fauna. Three of them, *Flosmaris mutsuensis*, *Hormathia andersoni* and *Verrillactis paguri* belonging to sea anemones are newly recorded to Korean waters (Table. 5).

Song (1984) first recorded 8 species in Korean Actiniaria, of which 5 species occurred in Korea Strait. Up to this time, the actinarians known from Korean waters are turned out to be 10 species in 5 families, but 9 species except for *Paracondylactic hertwigi* are distributed in Korea Strait. The scleractians known from Korean waters were 24 species in 5 families, of which 9 species in 4 families are distributed in Korea

Table 5. Distribution of zoantharian and ceriantipatharian species in relation to regions.

species	regions	Yellow Sea	Korea Strait	Cheju Is. area	Sea of Japan
<i>Actinia equina</i>			+	+	+
<i>Anthopleura japonica</i>		+	*		+
<i>A. kurogané</i>		+	+	+	+
<i>A. midori</i>		+	+	+	+
<i>A. pacifica</i>			*		+
<i>Epiactis japonica</i>			+		+
<i>Flosmaris mutsuensis</i>			**		
<i>Hormathia andersoni</i>			**		
<i>Verrillactis paguri</i>			**		
<i>Haliplanella lucia</i>		+	+	+	+
<i>Culicia japonica</i>			+		+
<i>Oulangia stokesiana miltoni</i>		+	+		
<i>Caryophyllia japonica</i>			+		+
<i>Cyathoceras niinoi</i>			+		
<i>Heterocyathus aequicostatus</i>		+	+		
<i>H. japonica</i>			+		+
<i>Flabellum transversale</i>			+		
<i>Dendrophyllia cribrosa</i>			+		+
<i>Rhizopsammia minuta mutsuensis</i>		+	+		+
<i>Antipathes japonica</i>			*	+	
<i>A. lata</i>			+	+	
Total no. of species		7	21	7	11

\*: new records to the Korea Strait.

\*\* : new records to the Korean waters.

Strait (Song, 1991).

Korean Antipatharia recorded two species, of which *Antipathes lata* occurred from Cheju Is. area to the southern part of Yellow Sea, and *A. japonica* only from Cheju Is. area (Song, 1987). But in this work, *A. japonica* was occurred from Yösoödo of Korea Strait.

## ABSTRACT

The zoantharians and ceriantiparians known from the Korea Strait are 21 species, 16 genera, 10 families in 3 orders, of which 6 species are newly recorded to the Korea Strait fauna. Three species of them are new to Korean waters: *Flosmaria mutsuensis*, *Hormathia andersoni* and *Verrillactis paguri*. The specimens were collected from 34 localities of Korea Strait from 1984 to 1991.

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## EXPLANATION OF PLATES 1-4

**Plate 1** (scale bar = 1 cm)

**Figs. 1-2.** *Flosmaris mutruensis*.

1, expanded state; 2, contracted state.

**Figs. 3-4.** *Verrillactis paguri*.

3, two specimens on shell; 4, two specimens both on shell and left chelicera.

**Figs. 5-8.** *Hormathia andersoni*.

5-6, showing oral parts; 7, contracted oral part, scapulus showing 12 dark tubercles; 8, contracted state, side view.

## **Plate 2**

**Figs. 1-5.** *Flosmaris mutsuensis*.

1, two basitrichs and two spirocysts, tentacle; 2, one basitrich and two microbasic p-mastigophores, actinopharynx; 3, one microbasic p-mastigophore, scapulus; 4, one basitrich and one microbasic p-mastigophore, scapus; 5, one basitrichs and one microbasic p-mastigophore, acontia.

**Figs. 6-9.** *Hormathia andersoni*.

6, two basitrichs and two spirocysts, tentacles; 7, two basitrichs, column; 8, one basitrich and two microbasic p-mastigophores, actinopharynx; 9, two basitrichs, acontia.

## **Plate 3**

**Figs. 1-6.** *Verrillactis paguri*.

1, one basitrichs, one microbasic amastigophore, and one spirocyst, actinopharynx; 2, two basitrichs, two microbasic amastigophores, and two spirocysts, tentacle; 3, two basitrichs, column; 4, one basitrich and one microbasic amastigophore, acontia; 5, one discharged microbasic amastigophore, acontia; 6, two microbasic amastigophores, acontia.

## **Plate 4**

**Figs. 1-2.** *Flosmaris mutsuensis*.

1, directives; 2, 1st, 2nd, and 3th mesenteries.

**Fig. 3.** *Hormathia andersoni*.

Directives, 2nd, and 3th mesenteries.

**Fig. 4.** *Verrillactis paguri*.

Directives, 1st, 2nd, 3th mesenteries.

## PLATE 1

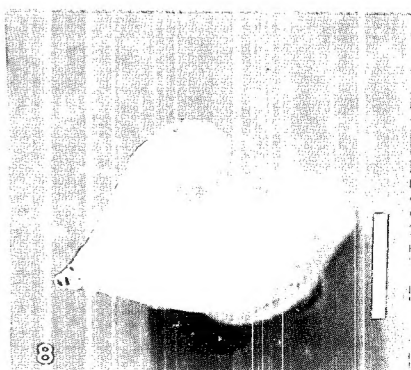
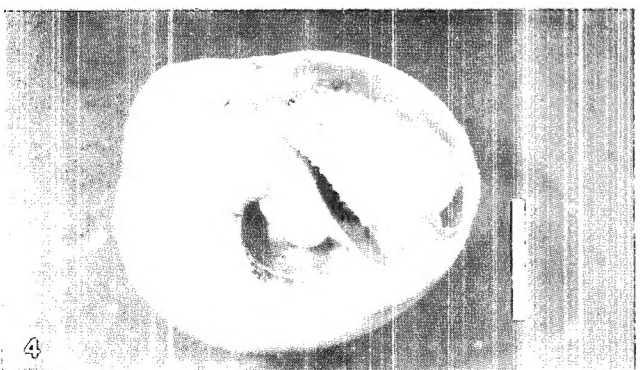
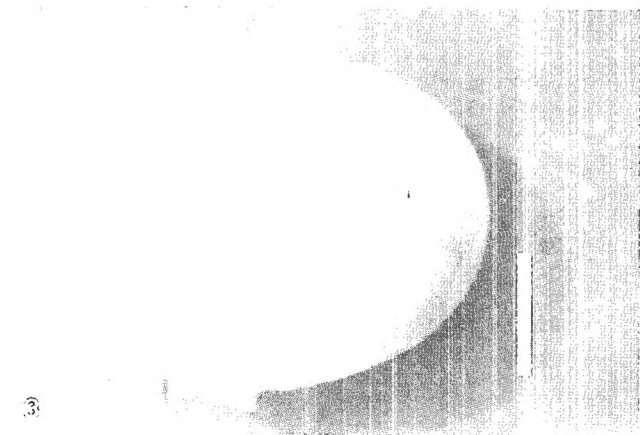
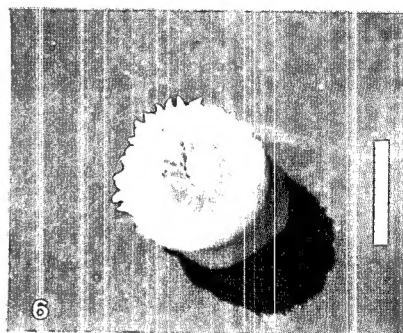
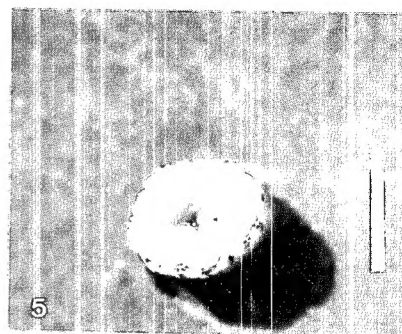
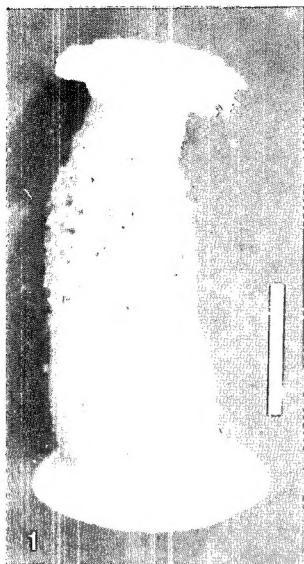
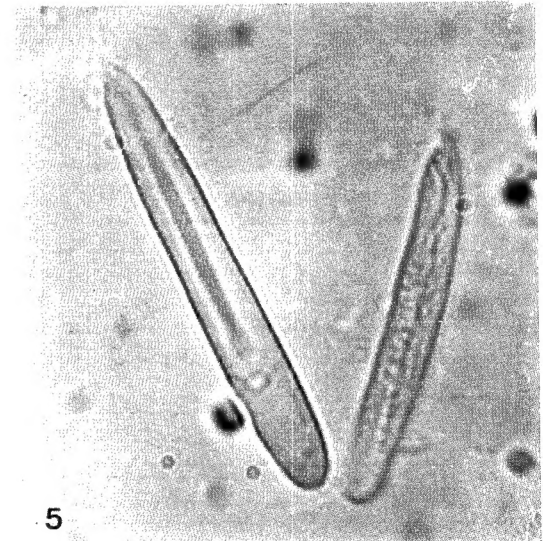
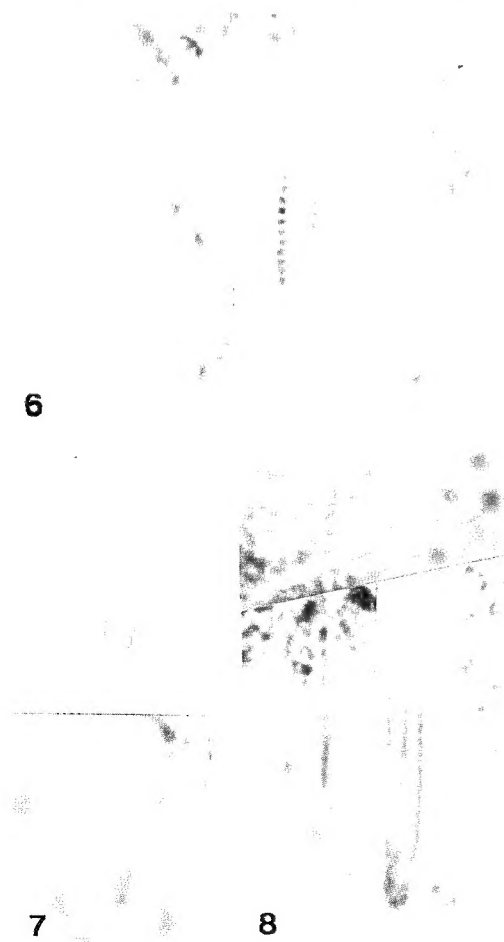
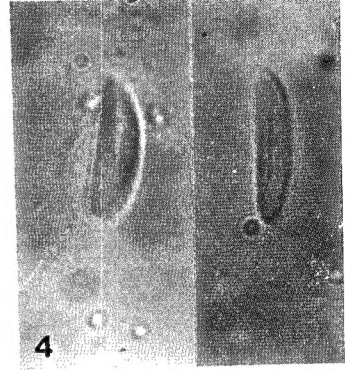




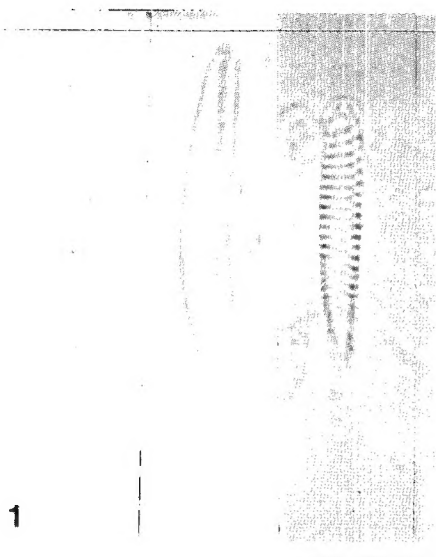
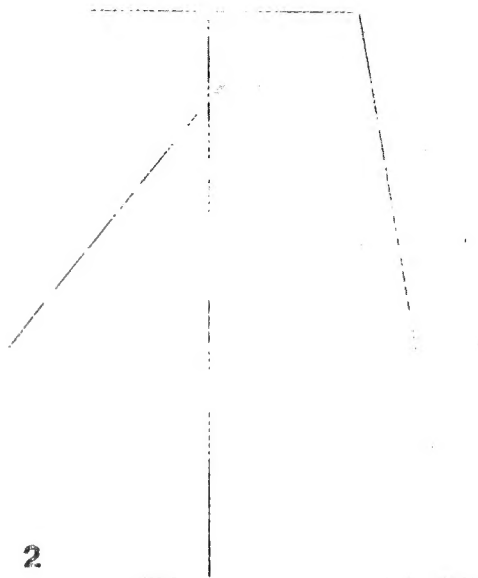
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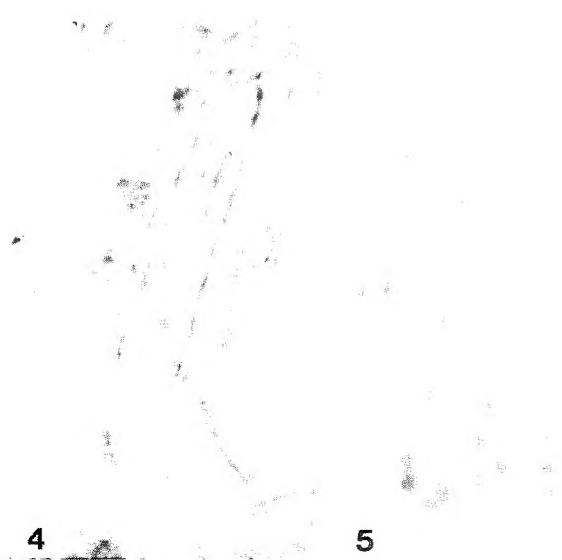
10  $\mu$

9

## PLATE 3

10  $\mu$ 

3



5

6

PLATE 4

